Were natural forms of treatment for Fasciola hepatica available to the Etruscans?

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Abstract

In the very distant past, European and Mediterranean peoples must have shared an extensive collection of folk experiences as to how certain plants were to be used as medicines. Plants comprise active secondary metabolites such as essential oils, alkaloids, bitters, flavonoids, tannins and glycosides, that can be used to heal, to cure or to prevent infection and disease. Some tantalizing hints of herbal folk-medicine may be discerned in the rare remnants of literary and archaeological evidence for the Etruscan culture, a distinctive group who dominated central Italy through the first half of the first millennium BC; much of their material culture and learning was subsumed by the Romans. New research into the Etruscan practice of divination from sheep livers, a skill for which they were held in high regard by the Romans, who themselves took up the practice, has shown that the liver could often be diseased. This paper investigates documentation for the plants known to the Etruscans, focusing particularly on those natural forms of treatment that would have been efficacious in terms of Fasciola hepatica (Liver fluke) infection.

Interestingly, some of the plants in the putative ancient Etruscan herbal remain in use in central Italy to the present day, where they continue to be efficacious in the treatment of digestive disorders and worm infestations.

Key words: Etruscan herbal, digestive disorders

1. INTRODUCTION - THE BRONTOSCOPIC CALENDAR

The Etruscans were the dominant culture of central Italy from the Iron Age (ca. 1000 BC) to the later first millennium BC; their material culture may be traced back into prehistory. The gradual takeover of Etruria by Rome led to the loss of their literature except for scant inscriptions and Greek and Latin glosses preserving vocabulary terms. Archaeological and iconographic evidence shows them to have developed innovative technologies, including their own distinctive versions of medicine and pharmacology. Some developments, such as the atrium-house, the tie-beam truss or the post-mortem C-section, have exerted far-reaching influence because they were acquired by Rome; we suggest that some herbal medicines may be traced at least back to ancient Etruscan practices.

In a recent exploration of the use of traditional knowledge of medicinal plants in Sardinia and Sicily compared with that recorded in historic sources of such knowledge, e.g. Dioscorides’ De Materia Medica...
(1st c. AD), Leonti and colleagues (1) documented no fewer than 170 medicinal species and detailed the effects of the 15 natural medicines most frequently used today in Italy. Of particular interest is their mention of frequent reports by ethnobotanical studies of Sicily that several Artemisia species have been used over the centuries for their digestive and vermifuge properties. This paper investigates further likelihood of the use of some of these plants for medicinal purposes in antiquity.

Recent research into the so called “Brontoscopic Calendar,” an Etruscan divination text probably created in the 8th-7th c. BC, links severe climatic events with the health of flocks and human societies (2, 3). This text was translated into Latin by Cicero’s friend Publius Nigidius Figulus (1st c. BC) but today is preserved only in a Byzantine Greek translation from Johannes Lydus’ De ostentis. Interestingly, a number of the predictions regarding thunder, rain and the health of sheep flocks could be interpreted as premonitions of, or perhaps even a primitive understanding about worm infections such as that caused by liver fluke - *Fasciola hepatica*. Here we attempt to assess the issue as to whether the Etruscans had access to medicinal plants that could have alleviated the symptoms or indeed cured the effects of *Fasciola hepatica* infection.

The Brontoscopic Calendar couples thunder and rain patterns throughout the summer months with predictions for human affairs and well-being. With this in mind, it is important to emphasize that the risk of severe outbreaks of *Fasciola hepatica* increases following wet summers and springs (4). Wet seasons provide an optimum habitat for the intermediate host *Lymnaea trunculata*, which can even take advantage of temporary habitats such as hoofmarks or rain ponds following heavy rains and flooding.

Even today one of the best means of forecasting a severe outbreak of *Fasciola hepatica* infection relies on such systems as the Stormont “wet day” computer model, which assesses rainfall and evaporation patterns in connection with geographical information and soil hydrology data (5).

We know that *Fasciola hepatica* infection in livestock is associated with ill thrift (weight loss and anaemia) as adult fluke build up in the bile duct, and that this progresses to a reduction in lambing numbers, weakness in livestock and ultimately, sudden death. Usually the clinical symptoms of this disease appear in sheep and cattle from late September onwards, but after wet summers this can extend well into the spring months.

The Brontoscopic Calendar claims specifically for the summer month of July – “Upon the new moon, if in any way it should thunder, there shall be plenty, yet there shall be ruin of the flocks”, and then again in August, on the thirteenth day after a new moon – “If in any way it should thunder, there will be plague upon the bodies of both humans and dumb animals”, whilst in October, fourteen days after the new moon it predicts – “If it thunders, it threatens war and the loss of flocks to death”. Later on in the calendar there is mention in February, fourteen days after the new moon - “If it thunders, it threatens loss of progeny ..”, and then in the spring month of March, ten days after the new moon - “If it thunders, destruction to the four-footed”, and respectively seven and eight days later in the same month - “If it thunders, something unexpected will befall the people; ruin upon ruin for men and four-footed beasts” and “If it thunders, it signifies a period of severe rain, and disease ..”.

At November 13, “if it thunders, a wealthy yet sickly period threatens, tormenting bodies with internal worms.” This is the only unequivocal reference to internal parasites, although the previous day’s omen predicts “If it thunders, it indicates insomnia for some time for men.” Since insomnia is one of the symptoms frequently linked with serious tapeworm infestation (especially beef tapeworm, *Taenia saginata*), this too may reflect parasite infection. (6, 7, 8)

Clearly then the Brontoscopic Calendar mentions thunder/rain in both the summer and spring months, and relates this occurrence to subsequent “plague”, “loss of progeny”, “ruin” and “death” in the flocks and four-footed livestock. Whether these predictions were perceived by the Etruscans as referring to disease, and indeed can be related to the incidence of *Fasciola hepatica* infection rather than some other problem, has sadly been lost over the centuries, and we are left wondering about the relevance and association of these seasonal predictions for animal and human health alike. Although having said this, we do have one recorded and authoritative insight into ancient links between climate, terrain, ecology and health, namely that of Marcus Vitruvius Pollio, the aristocratic author-architect of the period of Augustus.

“...For the ancestors, having sacrificed sheep which were grazing in those places where towns or permanent camps were being estab-
lished, used to examine the livers, and if they were pale and infected the first time, they would sacrifice another group, wondering whether they were injured because of disease or because of spoiled fodder. When they had tested many animals and demonstrated the whole and solid nature of the livers [that resulted from good] water and fodder, there they established their fortifications; if however they found [the livers] tainted they thus confirmed the judgement that a future pestilence would grow in the bodies of humans in these places even though there was ample food and water, and so they would move elsewhere and change area, seeking good health in all particulars...”.

Vitruvius, On architecture 1.4.9 (Translation JMT).

Figure 1. Roman sculpture 1st-2nd c. AD. A ram on an altar (No. 1963,1029.2). Courtesy of The Royal Collection © 2010 HM Queen Elizabeth II. This image clearly shows the rumen (R - spherical bulge) and proximal small-intestine (D - duodenum – left of the rumen) slightly protruding from the incision that has been made in the abdomen. The left lobe of the liver (L) with the umbilical fissure immediately below and the right lobe of the liver below that, can be seen covering the upper region of the rumen. At the time of going to press, this item is currently on display at The British Museum.

The Etruscan haruspices, divination priests expert in “reading” the livers of victims, were much respected by the Romans, who seem to have been critical of Etruscan culture in general, and thus were recognized for their expertise in the rites by which cities should be founded. There is additional evidence in finds of model sheep livers, such as the Etruscan bronze Liver of Piacenza, which may be related to much older Mesopotamian liver divination, that the affliction causing lesions on sacrificial victims’ livers was indeed Liver fluke (3, 9). Moreover, it has recently come to the author’s attention that a Roman 1st-2nd c. AD sculpture exists of a Ram on an altar, and that this sculpture depicts just such a “reading” since the rumen, proximal small intestine and both left and right liver lobes protrude through an opening in the abdomen.

2. AIM

The aim of this paper has been to investigate and document the plants not only present in Italy at the time of the Etruscans, but also those reportedly known to have been used by the Etruscans, focusing particularly on those natural forms of treatment that would have been efficacious in terms of Fasciola hepatica (Liver fluke) infection.

3. THE RISK OF FASCIOILA HEPATICA INFECTION

One might be forgiven for thinking that liver fluke infection in humans was only a problem for ancient peoples, and among them the Etruscans. However, a recent fifteen year study (1990-2004) of French watercress beds in the central Limousin region publishes a record that was kept of Fasciola hepatica contamination over the June and July months, showing that there is still a risk, albeit minor, for Europeans (10). Generally for an individual to run the risk of an acute infection they would normally need to ingest more than 10,000 metacercaria. Lower levels of infection are seen more frequently, and an estimate world-wide suggests that 2.4 million people may be afflicted (11). A study of Fasciola hepatica infection in the Mantaro valley of Peru revealed that individuals are most likely to become infected by living close to small streams (12). Infected individuals would normally present with a mild and intermittent fever, jaundice and anaemia and very often complain of a pain under the right costal margin. Jaundice and other liver infections are clearly described in antiquity, as are a variety of parasitic infections of the digestive tract (13).

The literature offers modern examples, with better documentation than is possible for ancient cases of parasitic infection. In a recent case report from Kuala Lumpur, one 56-year-old Malaysian male presented with right hypochondrial pain, which had persisted for a month, and also complained of fever (11). Treatment of this infection in these modern times would most likely be with an antihelmintic such as chloro-phenoxyl benzimidole (triclabendazole) at a dose of 10 mg/kg body weight and a complete re-
covery would then be expected. First introduced for use with animals in 1983 and against infections in man in Iran in 1989, triclabendazole is effective against all stages of *Fasciola* spp.

With such discoveries as the Chalcolithic Similaun "Iceman" (ca. 3300 BC), and advances in analyses of archaeological materials, it has become obvious that ancient Mediterranean (and other) populations suffered frequently from intestinal and other parasites. The Iceman was infected with whipworms (14, 15), while some ancient populations are known to have had roundworm and tapeworm infestations (16, 7). *Fasciola hepatica* was identified in a prehistoric German context (17), and today is endemic in cattle and sheep across central and southern Italy. Indeed it is clear that ancient Etruscan and Roman lifeways (agricultural practices, reliance on flocks and consumption of leafy plants etc.) were conducive to repeated cycles of infection.

Exactly how ancient peoples might have dealt with a *Fasciola hepatica* infection is less clear. More likely than not they would have only treated the symptoms of this infection, taking compounds that for example might help alleviate jaundice, fever, loss of appetite or pain. Whilst we do not have any written record of Etruscan medical or herbal practices with respect to *Fasciola hepatica* infection, we do have ancient accounts of compounds used to treat worm infections in man and of herbs used to treat some of the symptoms that are associated with just this form of infection. Sources include Roman and Greek authors on natural history and medicine, and even earlier Egyptian texts.

"...This peculiar glory of plants which I am now going to speak of, Mother Earth producing them sometimes for medicinal purposes only, rouses in one's mind admiration for the care and industry of the men of old; there was nothing left untried or unattempted by them, and furthermore nothing kept secret..." Pliny, *NH* 25.1 (18)

4. ANCIENT PARASITICIDES – available at the time of the Etruscans

The ancient Egyptian medical papyri recount that the major health problems were often caused by parasitic diseases, with the Ebers papyri (approx. 1500 BC, Leipzig) mentioning such herbal remedies as roots of pomegranate suspended in milk, and wormwood/absinthe suspended in wine, as being effective against intestinal parasitic worms (19).

In the remaining text we present a few herbal parasiticides that were most likely available to the ancient Etruscans, and may have been used by them to address the symptoms of *Fasciola hepatica* infection (see Table 1). The sources for knowledge of Etruscan plants/materia medica are archaeological finds, artistic representations (of the 7th through 2nd c. BC) and a few comments preserved by ancient Greek and Roman authors who referred to Etruscan terms or practices (20).

1.) Wild chamomile – *Chamomilla/Matricaria recutita* – constituents: volatile oil, flavonoids and tannic acid. Chamomile is used, according to Dioscorides, internally to treat pin and thread worms, peptic ulcers, gastro-intestinal spasm as well as inflammation of the respiratory and gastro-intestinal tracts.

"...They are taken as a drink for gaseousness, and for suffering from intestinal obstruction; they clean away jaundice, and cure liver ailments; and a decoction of them is used in warm packs for the bladder..." Dioscorides, 3-154, *Anthemis* (22)

Plants with a high tannin content, like chamomile, have been proven to be effective in parasite management. Indeed high-tannin forage can reduce parasite load by 50%, and use of plants with a high content of condensed tannins as a feed supplement for ruminants has been shown to be effective as a de-wormer (23). In the folk veterinary medicine of Italy, where more than 10% of reports document the use of plants as digestive and antiparasitic remedies, there is mention made of chamomile in connection with the treatment of digestive problems in ruminants (24).

Chamomile of various species is well attested in Roman Italy: for *Anthemis arvensis*, corn chamomile, see (25); Dioscorides 3.154; Pliny *NH* 22.53-54 for medical uses. Fragments of the plant were found in the Oplontis villa hay storage, and chamomile flowers are depicted in a number of Roman paintings. The existence of an Etruscan word, *apiana*, for the plant type indicates its earlier use in Italy.

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2 Bertoldi (21) pointed out a few additional plant names that must be Etruscan in origin, although they do not yield *materia medica*, for instance, *alaternus*, *laburnum*, and *siburnum*. He also noted that the Roman/Latin term *nepeta*, equated to Greek *kalaminthe* (*Mentha silvestris*), must derive from the name of the Etruscan city, Nepet (modern Nepi), although this is not recorded in the ancient literature (cf. Pliny *NH* 14.105).
Table 1. Plants and other possible materia medica known to the Etruscans - assimilated according to glosses and other references in ancient literary sources, and presented alongside other organic substances. See also references (21, 25, 54, 55).

<table>
<thead>
<tr>
<th>Name: Etruscan</th>
<th>Greek</th>
<th>Latin</th>
<th>Common/ modern</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apiata</td>
<td>Chamaemelon</td>
<td>Aegybitrium millefolium</td>
<td>Lesser celandine, pilewort, Ranunculus, horse celery Mod. Tuscany: appio</td>
<td>Diosc. 4.68 RV &amp; 4.10.5-7 (21)</td>
</tr>
<tr>
<td>Apium raninum</td>
<td>Selenon agrion (in Sardinia)</td>
<td>Apium</td>
<td>Feverfew pyrethrum parthenon</td>
<td>Diosc. 3.138 RV (21)</td>
</tr>
<tr>
<td>Ataison</td>
<td>Artemisia or absinthum</td>
<td>“vine that grows on trees”</td>
<td>Diosc. 3.3 RV; (21)</td>
<td></td>
</tr>
<tr>
<td>Kautam</td>
<td>Amarakon, anthemis</td>
<td>Millefolium Solis oculum</td>
<td>Feverfew pyrethrum parthenon</td>
<td>Diosc. 3.138 RV (21)</td>
</tr>
<tr>
<td>Cicenda</td>
<td>Gentianë</td>
<td>Gentiana Gentian (cicendia sp.)</td>
<td>Diosc. 3.3 RV; (21)</td>
<td></td>
</tr>
<tr>
<td>Corofis, cherifis, cloris, cloropis</td>
<td>Batrachion Selenon agrion</td>
<td>Apiurus</td>
<td>Diosc. 3.3 RV; (21)</td>
<td></td>
</tr>
<tr>
<td>Ephemeris</td>
<td>Cicuta</td>
<td>Geranium purpurrum “herb Robert” or meadow saffron (Colchicum)</td>
<td>Theophrastus Hist. Plant. 9.16.6 Pliny NH 24.16</td>
<td></td>
</tr>
<tr>
<td>Fabulonia</td>
<td>Hyoskyanos</td>
<td>Faba suilla, insana</td>
<td>Henbane, pork bean, bean of Jupiter</td>
<td>Diosc. 4.68 RV &amp; 4.10.5-7 (21)</td>
</tr>
<tr>
<td>Garuleum</td>
<td>Chrysanthemon Chalkar</td>
<td>Caltha</td>
<td>Bronze flower, Helichrysum Immortelle</td>
<td>Diosc. 4.58 RV (21)</td>
</tr>
<tr>
<td>Gigarum</td>
<td>Drakontia mikra</td>
<td>Arum arum dioscords, beta leporina</td>
<td>Arum italicum, gigaros. Mod. Siena: gigaro Cuckoo Pint</td>
<td>Diosc. 2.166-167 RV; (21)</td>
</tr>
<tr>
<td>Granatum</td>
<td>Punicum Kind = sida</td>
<td>Pomegranate</td>
<td>Diosc. 1.153</td>
<td></td>
</tr>
<tr>
<td>Lappa minor</td>
<td>Erythrodanon</td>
<td>Rubia sativa</td>
<td>Cultivated madder, “small burr” USDA: Arctium minus Bernh. = lesser burdock</td>
<td>Diosc. 3.143 RV (21)</td>
</tr>
<tr>
<td>Masuripos</td>
<td>(Phoenician) Anagallis</td>
<td>Macia, antoura, toura etc.</td>
<td>Scarlet pimpernel</td>
<td>Diosc. 3.3 RV; (21)</td>
</tr>
<tr>
<td>Mutuka</td>
<td>Thymos</td>
<td>Thumum</td>
<td>Thyme</td>
<td>Diosc. 3.36 RV; (21)</td>
</tr>
<tr>
<td>Myriophilon</td>
<td>Millofolium</td>
<td>Millefolium</td>
<td>Water- milfoil</td>
<td>Pliny 24.152</td>
</tr>
<tr>
<td>Radia</td>
<td>Smilax tracheia</td>
<td>Mergina</td>
<td>Rough bindweed, Prickly smilax</td>
<td>Diosc. 4.142 RV; (21)</td>
</tr>
<tr>
<td>Spina alba</td>
<td>Leukakantha</td>
<td>Geniculata kardous</td>
<td>White thistle, tuberous thistle</td>
<td>Diosc. 3.19 RV</td>
</tr>
<tr>
<td>Sycinum</td>
<td>Asaron/ nardos agria</td>
<td>Perpressa Banchar</td>
<td>Wild spikenard, valerian, blood of Ares</td>
<td>Diosc. 4.110 RV &amp; 3.102 RV (21)</td>
</tr>
<tr>
<td>Tantum</td>
<td>Anagallis kyane (Blue)</td>
<td>Meciatura, antura</td>
<td>Eye of the cat, blue pimpernel</td>
<td>Diosc. 2.178 RV</td>
</tr>
<tr>
<td>Typhë</td>
<td>Thyphe</td>
<td>Thinxa angustifolia and latifolia bulrush</td>
<td>Theophrastus Hist. Plant. 1.5.3 &amp; 4.10.5-7</td>
<td></td>
</tr>
<tr>
<td>Tura</td>
<td>Substances</td>
<td>Thus, thuiris</td>
<td>Incense</td>
<td>Zagreb Liber lintus 2.10 etc.</td>
</tr>
</tbody>
</table>

See for some modern common names, USDA Natural Resources Conservation Service, Plants Database (consulted 9/11/2009)
The classical references to the Etruscan language must be used with caution: many authors were writing centuries after Etruscan ceased to be spoken, and many spellings betray contaminated sources. Still, the glosses, most of them from Dioscorides, are a sound indication that these or similar plants were indeed known/used in first-millennium BC Etruria. (RV is the designation established by Max Wellman, an editor of Dioscorides manuscripts, to note that a supposedly Etruscan word was added to the manuscript as a note, probably copied from some now-lost reference work, and may not have been recorded by Dioscorides himself. See also (38).)

9) Ephemeris – many plants have been identified by this term (59). Hesychius, for instance, equates ephemeris with cicuta... other authors said that ephemeris has lily-like leaves and light-coloured, aromatic flowers, lives in shady areas and is an astringent. Theophrastus says that the Tyrrhenians (i.e. Etruscans) produced this drug especially in their settlement of Heraclea, although we do not know exactly where in Etruria

3 Bertoldi (56) noted that Cautha was an Etruscan deity associated with the Sun god; she was perhaps his daughter, and is named on the bronze Liver of Piacenza (57).
this would have been, since many sites were probably named for the Greek hero Hercle, said to have had adventures in Italy. *Ephemerum* was said to be poisonous, requiring special preparation. Dalby (60) identifies it as meadow saffron, believed to be "Medea’s favourite poison".

11.) Immortelle – *Helichrysum arenarium* – a member of the Daisy family. Some marigold species have been identified in plant remains preserved by the eruption of Vesuvius, although it is not possible to prove which species was known to the Etruscans prior to that time. Corn marigold, *Chrysanthemum segetum*, was found in Oplontis hay (61); Pliny *NH* 26.87; Dioscorides 4.58 it is found today in Italy in cultivated ground and was probably used by the Romans for colourful garlands.

18.) *Millefolium* – Pliny *(NH* 24.152) said it was found in Etruria and was good for toothache and wound healing; it was mixed with lard as an unguent for oxen who have been cut by the plough.

3.) Wormwood – *Artemisia absinthum* – constituents: phenolic acids, volatile oil and sesquiterpene lactones. Wormwood is known to be antiparasitic, antihelminthic, anti-inflammatory, an aromatic tonic bitter, a carminative and a choleretic (reducing cholesterol levels) as well as reputedly enhancing the immune system.

"...Another [remedy] to drive out the he-fat-worm (Ascaris?): afa(wild lettuce?) 1, wormwood/absinthe (sam) 1, vegetable mucus (hesa) 1: mix as one thing and eat. He will then evacuate all worms which are in his belly...”

Ebers Papyrus, 64 (19)

"...Three cups of a dilution or decoction of it (taken every day) heals lack of appetite and jaundice...Especially around Propontis and Thrace a wine is made from it which is called absinthe, which they use in the absence of fever for the purposes previously mentioned. They drink to each other with it in the summer thinking it to cause health...”

Dioscorides, 3-26, Apsinthion (22)

"...[Wormwood] with sil, Gallic nard and a little vinegar, brings away bile, promotes urine, soothes the bowels, curing them when in pain, drives out worms from the belly, and removes nausea and flatulence...”

Pliny *NH* 27.48 (26)

Wormwood tincture is still used in the West Indies as a worm preventative in horses, cattle and sheep, but more importantly elderly individuals in rural Central Italy state that they still add a handful of the aerial parts of wormwood to the drinking troughs of cows as an antihelminthic (27).

Constituents of the leaves, stem and flowers of wormwood have been shown to include bitter substances (sesquiterpene lactones – mainly absinthin) and essential oils. It is this essential oil fraction, that contains the potentially toxic monoterpene thujone, which is implicated in the antihelminthic properties of wormwood (28).

Ancient populations in Italy would have had access to wormwood (29): pollen of *Artemisia* species was identified in the region of Pompeii, but no specimens of the plants have been retrieved (30, 31).
infection (27, 24), one could translate this line as “...The juice of the decoction [Centaury] also prevents diseases.”.

Although Pliny (NH 21.48) says this plant was discovered by Greeks and acquired later in Italy, it actually is native to Italy, and has been attested in a poem of the second century BC (Meleager, Garland, in Greek Anthology 4.1.40: see 31, 37.)

7.) Gentian - Gentiana lutea - constituents: glycosides, gentiopicrin (bitters), amarogentin, gentianine. Gentian is used in conventional and homeopathic medicine for digestive disorders, loss of appetite, flatulence, and to stimulate digestive secretions (20). The gloss cicenda indicates Etruscan knowledge of the plant.

10.) Henbane - Hyoscyamus niger - constituents: alkaloids, hyoscyamine, scopoline, atropine, tannins. Henbane is used medicinally to treat asthma, colic and Parkinson’s disease, to reduce muscular tension before surgery, to treat coughs and spasms, and was used formerly as a sedative and painkiller (20). The gloss fabulonia places this plant in Etruscan Italy.

11.) Immortelle - Helichrysum arenarium - constituents: bitters, tannins, essential oil, flavonoids. Immortelle is used to stimulate digestive juices, strengthen the pancreas and as an anti-viral, anti-inflammatory and analgesic (20). Whatever bright golden flower was indicated by Etruscan garuleum, the existence of the word indicates its availability in early Italy.

12.) Cuckoo Pint - Arum italicum - constituents: saponins, alkaloids especially consine. Arum is used medicinally as an anti-bacterial and anti-fungal agent as well as an expectorant and anti-rheumatic (20). The name gigarum, which survives in modern Tuscan dialect, attests the knowledge of Arum in Etruria; its name gigarum, which survives in modern Tuscan dialect, attests the knowledge of Arum in Etruria; its root, similar to taro, was used for food, but had to be slaked to remove its poisons (38).

13.) Pomegranate rinds/roots - Punica granatum - constituents: hydrolyzable tannins (punicalagin) and alkaloids. It is a bitter, a vermifuge and an antihelmintic. Decotions of pomegranate are used to treat round- and pin-worm infections, as well as being effective against irritable bowel and dysentery.

"...A decoction of the roots expels and kills worms hidden in the intestines..." Dioscorides, 1:153, Sidia (22)

Cato, writing in the 2nd c. BC, prescribed crushed pomegranates in wine as a remedy for gastrointestinal troubles, including (round)worms and tapeworms (taeniae et lumbrici), in his de Agri cultura 126.

Of particular interest perhaps is the fact that a recent interview of some 300 farmers, shepherds and other elderly individuals in rural Central Italy revealed that traditional herbal practice still recommends an infusion of the bark of the pomegranate to children as a cure for worm infections (27).

Animal research has shown that pomegranates have a high tannin content and as such, are effective antihelmintic herbs (39). Punica granatum bark and root are documented sources of botanical molluscicides, although exactly how they work has yet to be discovered. They are known to contain a number of alkaloids belonging to the pyridine group, among them iso-pelletierine, which is a most potent taenicide (tapeworm toxin) (35).

Pomegranates appear frequently in Etruscan art, often associated with the Underworld and its gods, and with funerary banquets, no doubt because of the Persephone myth (40). They were common during the Roman period, as evidenced in finds at the cities destroyed by Vesuvius in 79 AD. Over a ton of pomegranates were found in a storeroom of the Roman villa at Oplontis, where they had been packed in layers of straw (41). Pliny and other authors indicate that, although named “Punic apples” the fruit had been cultivated in Italy since prehistoric times. (Pliny NH 13.112-113, 15.100; and 23.106-113 and 30.50 for medicinal uses.)

14.) Madder - Rubia sativa - Madder was used historically as a chologogue, an emmenagogue and a diuretic, but due to its carcinogenic potential it is no longer used (20).

16, 23.) Pimpernel - Anagallis arvensis - constituents: saponins, tannins, flavonoids, cucurbitacins. Pimpernel is used in homeopathic medicine to treat rashes and liver and gallbladder problems. It is a diuretic, detoxifier, expectorant and induces sweating (20).

Both types of pimpernel, scarlet and blue, were identified in fruiting branches found among the hay stored in the Oplontis Villa (25). Theophrastus Hist.Pl. 7.7.2, Pliny NH 25.144, 26.35, 26.55, 80, 90, 118, 119, 144; Dioscorides 2.209. Currently, in the folk-medicine of the Bay of Naples region, they are used as a home remedy with diaphoretic and diuretic properties, and for cirrhosis of the liver. The Etruscan terms show early familiarity with the species.

17.) Thyme - Thymus vulgaris - constituents: essential oils notably thymol, tannins, bitters, flavones, rosmarinic acid. Thyme is used medicinally as an expectorant and mild anaesthetic for coughs and both acute and chronic bronchitis (20). Thyme was common in early Etruria, known under the name mutuka; for culinary uses and ancient references (42).
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19.) Rough bindweed – *Smilax aspera* – constituents: saponins, glycosides – sarsapoin, smilacin and pollinatanin, tannins, flavonoids, volatile oil, smilagenin. Rough bindweed is used occasionally with other medicines as a laxative and has been shown to improve skin lesions and psoriasis (20). The Etruscan name *radia* attests their familiarity with this plant.

21.) Tuberous thistle – *Cirsium tuberosum* – constituents: volatile alkaloids, cnicin. The tuberous thistle has been used medicinally as an emetic and emmenagogue (20). Traces of a different thistle, *Cardius pycnocephalus* “slender thistle” were present in the Oplontis hay stores. Pliny discusses several thistle varieties, *NH* 18.153, 21.91, 21.94. It is now a weed of waste areas and roadsides throughout the Mediterranean (43).

22.) Valerian – *Valeriana officinalis* – constituents: valepotriates, valeric acids, alkaloids, volatile oils and γ-Aminobutyric acid (GABA). Valerian is used in homeopathic medicine to treat nervous tension, insomnia and intestinal problems, headaches, irritable bowel syndrome and eczema (20). It must have been known in Etruria, since the Etruscan term *sucinum* has been preserved.

25.) Myrrh – *Commiphora molmol* – constituents: myrrhol (volatile oil). Myrrh has proven over and over again to be one of the finest antibacterial and antiviral agents placed on earth. It is bitter, an astringent, an anti-inflammatory, a carminative, a vulnerary (cleansing and healing open wounds), an antifungal, an expectorant, a diaphoretic (increase perspiration), a deodorant and an emmenagogue (promoting menstrual flow). It is also an effective antihelmintic as noted by Dioscorides:

“...It kills worms and is chewed for stinking breath..."Dioscorides, 1-77, Smurna (22)

Although myrrh is mentioned by ancient authors as a spice for banquet wine (44) and in relation to worm infections, it is also listed by Pliny the Elder as being among the world’s then most expensive products to be collected from trees and shrubs, along with amber, balsam and frankincense. *Tura*, Etruscan for “incense” cited in the rituals listed in the *Linen book of Zagreb* (rachth tura: “burn incense” (45; but see also 46) is probably frankincense, one of the varieties of resin imported from the Near East or Levant. Deposits of resin that greatly resemble the frankincense used today, amber-coloured nodules of clear resin, have been found as offerings in some Iron Age Etruscan tombs, such as a “princely tomb” at Casale Marittimo in coastal Etruria (47). The use of incense, a Near Eastern commodity, was instituted in Etruria during the early Orientalizing period, as illustrated in a growing number of finds in Etruscan tombs; the terms *libanos* and *myrrha* still betray the Near Eastern origins of such substances (48). Myrrh per se has seldom been identified as yet among archaeological contexts in Etruria, but the profile of Near Eastern imports to Etruria from the 8th c. BC on suggests that it, too, was among the commodities acquired by the Etruscan elite.5

It is questionable then as to whether such an expensive commodity would have been used to treat parasitic worm infections, among them *Fasciola hepatica*, but its considerable efficacy, and the knowledge thereof in Near Eastern medicine makes it likely.

In a recent trial involving children infected with *Fasciola hepatica* in Egypt, 10 mg/kg/d of myrrh, the oleo-gum resin from the *Commiphora molmol* tree, was given over a 6 day period, one hour before breakfast. Soliman and colleagues (50) noted a 90.9% rate of cure for *Fasciola hepatica* at a check-up four weeks after the treatment with myrrh had been discontinued. The remaining 9.1% of children infected with *Fasciola hepatica* after the first 6 day period of treatment with myrrh were subsequently cured by a second round of treatment. (See also 51.)

5. SUMMARY AND CONCLUSIONS

Sheep, which graze close to the ground, tend to be more susceptible to internal parasites than other animals, making them barometers for detecting parasitic infections in a region. Etruscan haruspicy, divination by sheep livers, would have furnished this sort of information, even though it was couched in religious terminology. Perhaps also of importance is the link even today with watercress beds and the risk of liver fluke infection. Whilst ancient peoples would not have been aware of the richness of watercress in terms of vitamins A,B,C and B 2, as well as iron, copper, magnesium and calcium, it seems reasonable to assume that they may have been aware that consumption of watercress by ruminants increases their milk yield. However, with access to watercress beds comes a risk of liver fluke infection and a need to control the subsequent effects for infected livestock and the risk of human infection.

Many of the ancient medical traditions have been lost with time, perhaps as Pliny describes, being retained only as folk medicine;

“...But we moderns desire to hide and suppress the discoveries worked out by these investigators, and to cheat human life even of the good

4 A 7th c. BC tomb in the Granate necropolis at Populonia held a deposit of dark brown resin which Passerini (49) analysed as a balsamic resin, probably myrrh.

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things that have been won by others. Yes indeed, those who have gained a little knowledge keep it in a grudging spirit secret to themselves, and to teach nobody else increases the prestige of their learning...” Pliny NH 25.1 (52)

Some ancient medical treatises are, however, still extant, for example the Ebers papyri and the De Materia Medica of Dioscorides, and these texts can often provide an insight into ancient practices. Of relevance perhaps to the subject of Hepatica fasciola infection is one such comment by Pliny, who writes in the 1st c. AD (NH 27.45), “...the Pontic [wormwood comes] from Pontus, where cattle fatten on it...” (53). It does not seem unreasonable, with current scientific knowledge, to assume therefore that the point about wormwood and fat cattle is linked, and that the ingestion of wormwood would have controlled liver fluke infections in livestock, enabling them to grow “fat”. Another means of Fasciola hepatica control that might have been practised by the Etruscans, involves the rind of pomegranates. Whilst there is no documented evidence for such a practice, had the Etruscans discarded their pomegranate rinds into the spring or stream that was the source of their drinking water, the water soluble molluscicides in Punica granatum would have efficiently killed the semi-aquatic snails (Lymnae) that form a vital part of the life-cycle of liver fluke. Alternatively, since in normal years worm larvae numbers on pastures would be expected to peak in July and August, the habit of drinking the wine called absinthe (some mixture containing wormwood) referred to by Dioscorides “...they drink to each other with it in the summer thinking it to cause health...” may just conceivably be indicative of a form of herbal preventative against infection from Fasciola hepatica.

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CONFLICT OF INTEREST

The authors have declared that no conflict of interest exists.

REFERENCES

17. Dittmar K, Teegen WR. The presence of Fasciola hepatica (liver-fluke) in humans and cattle from a 4,500 year old archaeological site in the Saale-Unstrut Valley, Germany. Memorias do Instituto Oswaldo Cruz 2003; 98 (Suppl. 1): 141-143.
22. Dioscorides P. De Materia Medica – Being an herbal with many other medicinal materials, written in Greek in the first century of the common era. A new indexed version in modern English.


32. See Reference 18, p. 359.


36. See Reference 18, p. 185 and note c.

37. See Reference 25, p. 98.

38. See Reference 29, pp. 28-29.


42. See Reference 29, pp. 327-328.

43. See Reference 25, pp. 96-97.

44. See Reference 29, p. 226.


52. See Reference 18, p. 137.

53. See Reference 18, p. 417.


56. See Reference 21, pp. 305-309.


60. See Reference 29, p. 90, “Cholchicum.”

61. See Reference 25, p. 100.